The specification is being amended to correct minor errors in wording and so that certain portions of the specification will be consistent with other portions of the specification. Specifically, with respect to the amended language found in:

the paragraph beginning on page 2, line 20, the term --optical spot size-- is more appropriate than "magnetic grain size" and is consistent with terminology used elsewhere in the background, e.g., on page 3, line 16.

the paragraph beginning on page 4, line 8, the term --frequency-- is more appropriate than "wavelength" and is consistent with the term "resonant frequency" used in the same sentence.

the paragraph beginning on page 8, line 11 and the paragraph beginning on page 8, line 21, the descriptions of the figures have been amended to eliminate any confusion that might have been caused by the language being deleted.

the paragraph beginning on page 9, line 22, the amended language is consistent with the sentence beginning on page 23, line 3.

the paragraph beginning on page 10, line 1, the amended language is consistent with the sentence beginning on page 23, line 17.

the paragraph beginning on page 10, line 4, the amended language is consistent with the sentence beginning on page 23, line 20.

the paragraph beginning on page 10, line 11, the words "air bearing" are being deleted to improve the readability of the corresponding sentence.

the paragraph beginning on page 12, line 21, the inserted phrase --(shown here as a slit)-- is consistent with the specification generally, and, for example, with Claim 15. The inserted phrase --in the optical resonance elements-- is consistent with the specification generally, and, for example, with Claim 8.

the paragraph beginning on page 17, line 17, a minor change in wording has been made to improve the readability of the corresponding sentence.

the paragraph beginning on page 18, line 5, the word --and-- has been inserted to improve the readability of the corresponding sentence.

the paragraph beginning on page 20, line 14, minor changes in wording have been made to improve the readability of the corresponding sentence.

the paragraph beginning on page 22, line 12, the word --slits-- has replaced the word "holes", which is now consistent with the previous sentence. In addition, the abbreviation "SP" is now spelled out.

the paragraph beginning on page 23, line 3, a grammatical error has been corrected.

the paragraph beginning on page 24, line 3, grammatical errors have been corrected with respect to the word "nanometer". In addition, the number --0.01-- has replaced the number "0.1", to be consistent with the previous sentence and with FIGURE 15C.

the paragraph beginning on page 24, line 17, a minor grammatical error has been corrected.

Respectfully submitted,
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APPENDIX A (Clean version)

IN THE SPECIFICATION:

The paragraph beginning on page 2, line 20:

A7

Several approaches to TAMR have been proposed, including the use of a laser beam to heat the magnetic recording layer, as described in "Data Recording at Ultra High Density", *IBM Technical Disclosure Bulletin*, Vol. 39, No. 7, July 1996, p. 237; "Thermally-Assisted Magnetic Recording", *IBM Technical Disclosure Bulletin*, Vol. 40, No. 10, October 1997, p. 65; and IBM's U.S. patent 5,583,727. A read/write head for use in a TAMR system is described in U.S. patent 5,986,978, wherein a special optical channel is fabricated adjacent to the pole or within the gap of a write head for directing laser light (or heat) down the channel. However, these technologies are generally limited to an optical spot size in the recording medium on the order of a wavelength of the light source.

The paragraph beginning on page 4, line 8:

A8

One embodiment of the invention is an apparatus for facilitating the recording of data. The apparatus includes an optical source and a metallic structure that receives optical radiation from the optical source. The metallic structure includes an emission region from which optical output is emitted, as well as an array of features that couple the radiation to at least one surface plasmon mode of the structure to increase the emitted optical output from the emission region beyond what the emitted optical output from the emission region would be in the absence of the features. The emitted optical output includes a near-field portion that extends from the emission

region out to a distance less than the average wavelength of the emitted optical output (e.g., the intensity weighted average wavelength). The apparatus further includes at least one element secured to the metallic structure, with this element generating magnetic fields for writing data in a data recording medium located within the near-field portion. A preferred apparatus further includes a platform (e.g., slider having an air bearing surface) to which the structure and the (at least one) element are secured, in which the platform is configured to be moved relative to a data recording medium while the separation between the emission region and a surface of the data recording medium is kept to less than the average wavelength. The emission region may be advantageously located at an output face of the laser and may include dielectric material. The optical source may include an optical waveguide coupled to a source of optical radiation. Optical radiation from the optical source preferably has a full width half maximum (FWHM) of less than about 0.1 times the average wavelength of the optical radiation. The optical radiation preferably also includes a frequency that matches a resonant frequency of the structure. The spacing between the features in the metal structure is chosen to enhance the optical output from the emission region from at least one predetermined wavelength, and in one embodiment, the structure may include two features. The (at least one) element that generates magnetic fields may include at least one poling piece for applying a magnetic field in a portion of a storage medium, as the emitted optical output from the emission region heats this portion.

A8 cont

The paragraph beginning on page 8, line 11:

A9

FIGURES 9A and 9B show a partial cross sectional end view and an ABS view, respectively, of an optical device that includes an optical resonance member having a periodic array of ridges in a metallic layer and a slit through which optical radiation is emitted;

The paragraph beginning on page 8, line 21:

A10

FIGURES 11A and 11B show a partial cross sectional end view and an ABS view, respectively, of an optical device that includes an optical resonance member having a periodic array of ridges in a metallic layer and a protrusion member from which optical radiation is emitted;

The paragraph beginning on page 9, line 22:

A11

FIGURE 17 shows additional transmission data through a silver (on quartz) grating (slit spacing of 450 nanometers) for film thicknesses of 225 nanometers and 300 nanometers;

The paragraph beginning on page 10, line 1:

A12

FIGURE 18A is a scanning electron micrograph image of a silver (on quartz) film structure having a single slit (of width 35 nanometers) between 120 nanometer high ridges (in the metal film) separated by 450 nanometers;

The paragraph beginning on page 10, line 4:

A13

FIGURE 18B shows transmission spectra for structures consisting of a single, isolated slit in 225 nanometer thick silver and tungsten films (on quartz), respectively; and

The paragraph beginning on page 10, line 11:

A14

Referring now to the drawings wherein like reference numerals designate like or similar parts throughout the several views, FIGURES 1-3 illustrate a magnetic disk drive 30. The drive 30 includes a spindle 32 that supports and rotates a magnetic disk 34. The spindle 32 is rotated by a motor 36 that is controlled by a motor controller 38. A combined read and write magnetic head 40 is mounted on a slider 42 that is supported by a suspension 44 and actuator arm 46. A plurality of disks, sliders and suspensions may be employed in a large capacity direct access storage device (DASD) as shown in FIGURE 3. The suspension 44 and actuator arm 46 position the slider 42 so that the magnetic head 40 is in a transducing relationship with a surface of the magnetic disk 34. When the disk 34 is rotated by the motor 36, the slider is supported on a thin (typically in the range of 5-20 nanometers, e.g., 15 nanometers) cushion of air between the surface of the disk 34 and an air bearing surface (ABS) 48 of the slider 42. The magnetic head 40 may then be employed for writing information to multiple circular tracks on the surface of the disk 34, as well as for reading information therefrom. Processing circuitry 50 exchanges signals, representing such information, with the head 40, provides motor drive signals for rotating the magnetic disk 34, and provides control signals for moving the slider to various tracks. The components described hereinabove may be mounted on a frame 54 of a housing 55, as shown in FIGURE 3. In FIGURE 4 the slider 42 is shown mounted to the suspension 44.

The paragraph beginning on page 12, line 21:

A13

An expanded view of the resonance element 102 and the components that surround it is shown in FIGURE 6A. FIGURE 9A is a partial cross sectional end view of a preferred resonance element 102 showing the resonance element 102 adjoining the waveguide 203 and the cladding 204 surrounding the waveguide. The resonance element 102 shown here includes dielectric material 205 that joins the waveguide 203/cladding 204 to a metallic layer 206. The metallic layer 206 includes a series (e.g., a periodic array) of ridges 207 that protrude into the dielectric material 205. (Alternatively, the ridges could be built into the waveguide 203 without using the dielectric material 205.) The metallic layer 206 further includes a slit 208 through which optical radiation from the waveguide 203 passes and is directed onto the magnetic disk 34. Using the preferred embodiments herein, track widths of 10-200 nanometers, and more preferably 20-100 nanometers (corresponding to slit width ranges of about 5-100 nanometers and about 10-50 nanometers, respectively), may be realized by appropriately choosing the dimensions of the emission region (shown here as a slit). Preferred materials for the metallic layers in the optical resonance elements described herein include Au, Ag, Cu, Al, and Cr. With respect to the slits herein, they may be optionally protected by filling them with dielectric material.

The paragraph beginning on page 17, line 17:

A16

The in-track bit density may be determined, in part, by the field gradient produced by the magnetic pole pieces. In thermally-assisted magnetic recording, it is not necessary in general to have a large field gradient, since a large thermal gradient exists at the trailing edge of the heated

area. This thermal gradient is equivalent to a large field gradient since a magnetic recording medium has a temperature dependent coercivity. Thus, it is sufficient that the pole pieces just provide a large field that can be switched at high frequency for field- modulated writing of bits at the heated region's trailing edge. Field modulated writing allows the heated region to be elongated along the track direction (from an elongated aperture or slit) and still have a high bit density along the track. Because a large field gradient is not needed, the pole pieces may be larger and may be located further away from the heated region, while still providing a sufficiently large field amplitude.

A16 cont

The paragraph beginning on page 18, line 5:

A17

FIGURE 10 shows an alternative optical resonance element 102a that includes dielectric material 205a and a metallic layer 206a. The metallic layer 206a includes a periodic array of trenches 224 (as opposed to the periodic array of ridges 207 of FIGURES 9A and 9B), but this embodiment is otherwise designed like and functions similarly to its counterpart of FIGURES 9A and 9B. (Alternatively, trenches could be built into the waveguide 203, without using the dielectric material 205a.) Optical radiation incident on the resonance element 102a is directed through the slit 208 and onto the disk 34, with a substantial fraction of the near-field (i.e., less than one optical wavelength) intensity arising from surface plasmons generated in the metallic layer 206a.

The paragraph beginning on page 20, line 14:

A18 The device of FIGURES 13 and 14A, B may be assembled by constructing the slider 310/pole piece 326/insulating member 334/coils 340 portion of the device in one set of steps, and separately constructing the laser diode 302/mounting element 374/overcoat layer 376 portion of the device in another set of steps. These portions of the device may then be integrated along their common interface 410 by placing them both on an optical flat and bonding them together with conductive epoxy or conductive solder; using a conductive bonding element permits electrical connections to be made. At this point, gentle lapping of the assembled device may be necessary so that the air bearing surface 312 and the overcoat layer 376 form a smooth, continuous surface. The slit 396 may then be formed in the second reflector 360 through the use of a focused ion beam or e-beam lithography. Techniques for assembling such components are discussed in US Patent 5,625,617 to Hopkins et al., which is hereby incorporated by reference.

The paragraph beginning on page 22, line 12:

A19 Transmission can be increased substantially using geometries other than an array of holes. FIGURE 16A shows a scanning electron micrograph image of a metallic grating (225 thick silver on quartz) having a slit width of 50 nanometers and a slit spacing equal to 450 nanometers. FIGURES 16B, 16C, and 16D show zero-order transmission spectra for slit spacings of 225 nanometers, 330 nanometers, and 450 nanometers, respectively. For FIGURES 16B, 16C, and 16D, transmission is normalized to the fraction of the total area occupied by the slits. Transmission above one indicates that more light was transmitted though the slits than was

incident directly on the area occupied by the slits. For these data (as well as those of FIGURES 17 and 18), the incident collimated white light used to determine transmission was polarized perpendicular to the slits with normal incidence. FIGURE 16B shows experimental data for a waveguide transmission resonance (labeled WG in the Figures). The surface plasmon (SP) mode peak position as a function of wavelength depends linearly on the spacing between the slits according to $\lambda = a_0[\varepsilon_1\varepsilon_2/(\varepsilon_1+\varepsilon_2)]^{1/2}$, in which a_0 is the distance between slits. The SP mode at the air interface (SP-A) is weak relative to the SP mode at the quartz interface (SP-Q).

A19 cont

The paragraph beginning on page 23, line 3:

A20

FIGURE 17 shows transmission resonance data through metallic gratings (laid out like the grating shown in FIGURE 16A), having a slit width of 50 nanometers, a slit spacing of 450 nanometers, and film thicknesses of 225 and 300 nanometers. These data suggest that when using a diode laser emitting at 630 nanometers as the optical source for thermally assisted recording, an appropriate choice of metallic layer is one having a separation between the slits of about 450 nanometers. Other data suggest that surface plasmon enhanced transmission is increased substantially when using a high conductivity metal (such as Au, Ag, Al, and Cu) as opposed to a low conductivity metal (such as tungsten).

The paragraph beginning on page 24, line 3:

A21

As suggested by FIGURE 18C, the silver film of FIGURE 18A is tailored for transmission at 650 nanometers. Thus, a laser diode at this wavelength and a silver film having a

A21

lattice constant of about 450 nanometers effectively transmit 650 nanometers optical radiation. The transmission of this device is about 60 times larger at 650 nanometers (plasmon mode) than for the isolated slit in the film of tungsten at the same wavelength and 15 times larger at 715 nanometers (at the waveguide resonance) than for the isolated slit in the film of tungsten. As suggested by the fact that the normalized transmission is above one, this silver film device collects optical power over a region much larger than the slit itself and transmits the power effectively through a sub-wavelength opening. Note that the maximum transmission for this 35 nanometer slit structure (in which the transmission is approximately 10, see FIGURE 18C) is approximately 1000 times larger than for the 2-dimensional array of 40 nanometer diameter holes (for which the transmission is approximately 0.01, see FIGURE 15C), indicating that an emission region in the form of a slit may be advantageously used for ultrahigh density data recording.

The paragraph beginning on page 24, line 17:

A22

Although the recording of information has been described herein principally with respect to magnetic recording on a magnetic disk, embodiments of the invention may be used in conjunction with other kinds of recording media, such as magneto-optic, phase-change, or chemical-change, and may be caused or assisted by heating or photo-chemistry. The invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is therefore indicated by the appended claims rather than the foregoing description. All changes within the meaning and range of equivalency of the claims are to be embraced within that scope.

APPENDIX B (marked-up version)

IN THE SPECIFICATION:

The paragraph beginning on page 2, line 20:

Several approaches to TAMR have been proposed, including the use of a laser beam to heat the magnetic recording layer, as described in "Data Recording at Ultra High Density", *IBM Technical Disclosure Bulletin*, Vol. 39, No. 7, July 1996, p. 237; "Thermally-Assisted Magnetic Recording", *IBM Technical Disclosure Bulletin*, Vol. 40, No. 10, October 1997, p. 65; and IBM's U.S. patent 5,583,727. A read/write head for use in a TAMR system is described in U.S. patent 5,986,978, wherein a special optical channel is fabricated adjacent to the pole or within the gap of a write head for directing laser light (or heat) down the channel. However, these technologies are generally limited to [a magnetic grain] <u>an optical spot</u> size in the recording medium on the order of a wavelength of the light source.

The paragraph beginning on page 4, line 8:

One embodiment of the invention is an apparatus for facilitating the recording of data. The apparatus includes an optical source and a metallic structure that receives optical radiation from the optical source. The metallic structure includes an emission region from which optical output is emitted, as well as an array of features that couple the radiation to at least one surface plasmon mode of the structure to increase the emitted optical output from the emission region beyond what the emitted optical output from the emission region would be in the absence of the features. The emitted optical output includes a near-field portion that extends from the emission

region out to a distance less than the average wavelength of the emitted optical output (e.g., the intensity weighted average wavelength). The apparatus further includes at least one element secured to the metallic structure, with this element generating magnetic fields for writing data in a data recording medium located within the near-field portion. A preferred apparatus further includes a platform (e.g., slider having an air bearing surface) to which the structure and the (at least one) element are secured, in which the platform is configured to be moved relative to a data recording medium while the separation between the emission region and a surface of the data recording medium is kept to less than the average wavelength. The emission region may be advantageously located at an output face of the laser and may include dielectric material. The optical source may include an optical waveguide coupled to a source of optical radiation. Optical radiation from the optical source preferably has a full width half maximum (FWHM) of less than about 0.1 times the average wavelength of the optical radiation. The optical radiation preferably also includes a [wavelength] <u>frequency</u> that matches a resonant frequency of the structure. The spacing between the features in the metal structure is chosen to enhance the optical output from the emission region from at least one predetermined wavelength, and in one embodiment, the structure may include two features. The (at least one) element that generates magnetic fields may include at least one poling piece for applying a magnetic field in a portion of a storage medium, as the emitted optical output from the emission region heats this portion.

The paragraph beginning on page 8, line 11:

FIGURES 9A and 9B show a partial cross sectional end view [(of the same orientation as FIGURE 6A)] and an ABS view, respectively, of an optical device that includes an optical

resonance member having a periodic array of ridges in a metallic layer and a slit through which optical radiation is emitted;

The paragraph beginning on page 8, line 21:

FIGURES 11A and 11B show a partial cross sectional end view [(of the same orientation as FIGURE 6A)] and an ABS view, respectively, of an optical device that includes an optical resonance member having a periodic array of ridges in a metallic layer and a protrusion member from which optical radiation is emitted;

The paragraph beginning on page 9, line 22:

FIGURE 17 shows additional transmission data through a silver (on quartz) grating (slit [separation of 50] spacing of 450 nanometers) for film thicknesses of 225 nanometers and 300 nanometers;

The paragraph beginning on page 10, line 1:

FIGURE 18A is a scanning electron micrograph image of a silver (on quartz) film structure having a single slit (of width 35 nanometers) between [with] 120 [nanometers deep trenches] nanometer high ridges (in the metal film) separated by 450 nanometers[.] ;

The paragraph beginning on page 10, line 4:

FIGURE 18B shows transmission spectra for structures consisting of a single, isolated <u>slit in</u> 225 [nanometers wide slit in] <u>nanometer thick</u> silver and tungsten films (on quartz), respectively; and

The paragraph beginning on page 10, line 11:

Referring now to the drawings wherein like reference numerals designate like or similar parts throughout the several views, FIGURES 1-3 illustrate a magnetic disk drive 30. The drive 30 includes a spindle 32 that supports and rotates a magnetic disk 34. The spindle 32 is rotated by a motor 36 that is controlled by a motor controller 38. A combined read and write magnetic head 40 is mounted on a slider 42 that is supported by a suspension 44 and actuator arm 46. A plurality of disks, sliders and suspensions may be employed in a large capacity direct access storage device (DASD) as shown in FIGURE 3. The suspension 44 and actuator arm 46 position the slider 42 so that the magnetic head 40 is in a transducing relationship with a surface of the magnetic disk 34. When the disk 34 is rotated by the motor 36, the slider is supported on a thin (typically in the range of 5-20 nanometers, e.g., 15 nanometers) cushion of air [(air bearing)] between the surface of the disk 34 and an air bearing surface (ABS) 48 of the slider 42. The magnetic head 40 may then be employed for writing information to multiple circular tracks on the surface of the disk 34, as well as for reading information therefrom. Processing circuitry 50 exchanges signals, representing such information, with the head 40, provides motor drive signals for rotating the magnetic disk 34, and provides control signals for moving the slider to various

APPENDIX C

IN THE CLAIMS:

1. (Amended) An apparatus for facilitating the recording of data, comprising:

an optical source;

a metallic structure that receives optical radiation from the optical source and emits optical output from an emission region in said structure, said structure having an array of features that couple the radiation to at least one surface plasmon mode of said structure to increase the emitted optical output from said emission region beyond what the emitted optical output from said emission region would be in the absence of said features, wherein the emitted optical output includes a near-field portion that extends from said emission region out to a distance less than the average wavelength of the emitted optical output; and

at least one element secured to said metallic structure, said at least one element generating magnetic fields [for writing] <u>whose strength is sufficient to write</u> data in a data recording medium located within the near-field portion.

8. (Amended) The apparatus of Claim 1, wherein said [metal] <u>metallic</u> structure includes metal selected from the group consisting of Au, Ag, Cu, Al, and Cr.

10. (Amended) The apparatus of Claim 1, wherein the spacing between said features in said [metal] <u>metallic</u> structure is chosen to enhance the optical output from said emission region [from] <u>at</u> at least one predetermined wavelength.

11. (Amended) The apparatus of Claim 1, wherein said array includes recessed areas within said [metal] <u>metallic</u> structure.

12. (Amended) The apparatus of Claim 1, wherein the spacing between said features in said [metal] metallic structure is periodic.

13. (Amended) The apparatus of Claim 1, wherein said [metal] metallic structure is joined to at least one dielectric layer.

15. (Amended) The apparatus of Claim [11] 14, wherein said aperture is a slit.

16. (Amended) The apparatus of Claim [11] 14, wherein said aperture has a width at its narrowest point of about 10-100 nanometers.

21. (Amended) The apparatus of Claim 1, wherein the optical radiation has a [wavelength] frequency that matches a resonant frequency of said structure.

23. (Amended) A method of directing electromagnetic radiation onto a data recording medium, comprising:

providing a metal structure having an array of features;

directing optical radiation onto the array of features to generate at least one surface plasmon mode, thereby enhancing the optical output emanating from an emission region in the metal structure; and

directing the optical output from the emission region onto a recording medium to facilitate the recording of data [that is read back by a processor].

tracks. The components described hereinabove may be mounted on a frame 54 of a housing 55, as shown in FIGURE 3. In FIGURE 4 the slider 42 is shown mounted to the suspension 44.

The paragraph beginning on page 12, line 21:

An expanded view of the resonance element 102 and the components that surround it is shown in FIGURE 6A. FIGURE 9A is a partial cross sectional end view of a preferred resonance element 102 showing the resonance element 102 adjoining the waveguide 203 and the cladding 204 surrounding the waveguide. The resonance element 102 shown here includes dielectric material 205 that joins the waveguide 203/cladding 204 to a metallic layer 206. The metallic layer 206 includes a series (e.g., a periodic array) of ridges 207 that protrude into the dielectric material 205. (Alternatively, the ridges could be built into the waveguide 203 without using the dielectric material 205.) The metallic layer 206 further includes a slit 208 through which optical radiation from the waveguide 203 passes and is directed onto the magnetic disk 34. Using the preferred embodiments herein, track widths of 10-200 nanometers, and more preferably 20-100 nanometers (corresponding to slit width ranges of about 5-100 nanometers and about 10-50 nanometers, respectively), may be realized by appropriately choosing the dimensions of the emission region <u>(shown here as a slit)</u>. Preferred materials for the metallic layers <u>in the optical resonance elements</u> described herein include Au, Ag, Cu, Al, and Cr. With respect to the slits herein, they may be optionally protected by filling them with dielectric material.

The paragraph beginning on page 17, line 17:

The in-track bit density may be determined, in part, by the field gradient produced by the magnetic pole pieces. In thermally-assisted magnetic recording, it is not necessary in general to have a large field gradient, since a large thermal gradient exists at the trailing edge of the heated area. This thermal gradient is equivalent to a large field gradient since a magnetic recording medium has a temperature dependent coercivity. Thus, it is sufficient that the pole pieces just provide a large field that can be switched at high frequency for field- modulated writing of bits at the heated [region of the] region's trailing edge. Field modulated writing allows the heated region to be elongated along the track direction (from an elongated aperture or slit) and still have a high bit density along the track. Because a large field gradient is not needed, the pole pieces may be larger and may be located further away from the heated region, while still providing a sufficiently large field amplitude.

The paragraph beginning on page 18, line 5:

FIGURE 10 shows an alternative optical resonance element 102a that includes dielectric material 205a and a metallic layer 206a. The metallic layer 206a includes a periodic array of trenches 224 (as opposed to the periodic array of ridges 207 of FIGURES 9A and 9B), but this embodiment is otherwise designed like and functions similarly to its counterpart of FIGURES 9A and 9B. (Alternatively, trenches could be built into the waveguide 203, without using the dielectric material 205a.) Optical radiation incident on the resonance element 102a is directed through the slit 208 and onto the disk 34, with a substantial fraction of the near-field (i.e., less

than one optical wavelength) intensity arising from surface plasmons generated in the metallic layer 206a.

The paragraph beginning on page 20, line 14:

The device of FIGURES 13 and 14A, B may be assembled by constructing the slider 310/pole piece 326/insulating member 334/coils 340 portion of the device in one [step] <u>set of steps</u>, and separately constructing the laser diode 302/mounting element 374/overcoat layer 376 portion of the device in another [step] <u>set of steps</u>. These portions of the device may then be integrated along their common interface 410 by placing them both on an optical flat and bonding them together with conductive epoxy or conductive solder; using a conductive bonding element permits electrical connections to be made. At this point, gentle lapping of the assembled device may be necessary so that the air bearing surface 312 and the overcoat layer 376 form a smooth, continuous surface. The slit 396 may then be formed in the second reflector 360 through the use of a focused ion beam or e-beam lithography. Techniques for assembling such components are discussed in US Patent 5,625,617 to Hopkins et al., which is hereby incorporated by reference.

The paragraph beginning on page 22, line 12:

Transmission can be increased substantially using geometries other than an array of holes. FIGURE 16A shows a scanning electron micrograph image of a metallic grating (225 thick silver on quartz) having a slit width of 50 nanometers and a slit spacing equal to 450 nanometers. FIGURES 16B, 16C, and 16D show zero-order transmission spectra for slit spacings of 225

nanometers, 330 nanometers, and 450 nanometers, respectively. For FIGURES 16B, 16C, and 16D, transmission is normalized to the fraction of the total area occupied by the slits. Transmission above one indicates that more light was transmitted though the [holes] slits than was incident directly on the area occupied by the [holes] slits. For these data (as well as those of FIGURES 17 and 18), the incident collimated white light used to determine transmission was polarized perpendicular to the slits with normal incidence. FIGURE 16B shows experimental data for a waveguide transmission resonance (labeled WG in the Figures). The [SP] surface plasmon (SP) mode peak position as a function of wavelength depends linearly on the spacing between the slits according to $\lambda = a_0[\varepsilon_1\varepsilon_2/(\varepsilon_1 + \varepsilon_2)]^{1/2}$, in which a_0 is the distance between slits. The SP mode at the air interface (SP-A) is weak relative to the SP mode at the quartz interface (SP-Q).

The paragraph beginning on page 23, line 3:

FIGURE 17 shows transmission resonance data through metallic gratings (laid out like the grating shown in FIGURE 16A), having a slit width of 50 nanometers, a slit spacing of 450 nanometers, and [a] film thicknesses of 225 and 300 nanometers. These data suggest that when using a diode laser emitting at 630 nanometers as the optical source for thermally assisted recording, an appropriate choice of metallic layer is one having a separation between the slits of about 450 nanometers. Other data suggest that surface plasmon enhanced transmission is increased substantially when using a high conductivity metal (such as Au, Ag, Al, and Cu) as opposed to a low conductivity metal (such as tungsten).

The paragraph beginning on page 24, line 3:

As suggested by FIGURE 18C, the silver film of FIGURE 18A is tailored for transmission at 650 nanometers. Thus, a laser diode at this wavelength and a silver film having a lattice constant of about 450 nanometers effectively transmit 650 nanometers optical radiation. The transmission of this device is about 60 times larger at 650 nanometers (plasmon mode) than for the isolated slit in the film of tungsten at the same wavelength and 15 times larger at 715 nanometers (at the waveguide resonance) than for the isolated slit in the film of tungsten. As suggested by the fact that the normalized transmission is above one, this silver film device collects optical power over a region much larger than the slit itself and transmits the power effectively through a sub-wavelength opening. Note that the maximum transmission for this 35 [nanometers] <u>nanometer</u> slit structure (in which the transmission is approximately 10, see FIGURE 18C) is approximately 1000 times larger than for the 2-dimensional array of 40 [nanometers] <u>nanometer</u> diameter holes (for which the transmission is approximately [0.1] <u>0.01</u>, see FIGURE 15C), indicating that an emission region in the form of a slit may be advantageously used for ultrahigh density data recording.

The paragraph beginning on page 24, line 17:

Although the recording of information has been described herein principally with respect to magnetic recording on <u>a</u> magnetic disk, embodiments of the invention may be used in conjunction with other kinds of recording media, such as magneto-optic, phase-change, or chemical-change, and may be caused or assisted by heating or photo-chemistry. The invention

may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is therefore indicated by the appended claims rather than the foregoing description. All changes within the meaning and range of equivalency of the claims are to be embraced within that scope.